

DISCUSSIONS OF PAPERS ON BACTERIAL DISEASES

Chairman: Justin M. Andrews

Rapporteur: Philip S. Brachman

DISCUSSION OF: "AIRBORNE PULMONARY TUBERCULOSIS," RICHARD L. RILEY

DISCUSSION OF: "PNEUMONIC PLAGUE," KARL F. MEYER

Discussants: Walsh McDermott and
Gardner Middlebrook

Dr. McDermott and Dr. Middlebrook praised the experimental design and the presentation of the tuberculosis data. The spread of tuberculosis was emphasized as being related to the dangerous disseminator or the methods of dissemination, or both. Examples included the skid-row bum, the sailor who infected 90% of his fellow destroyer crew members, and the Danish schoolgirl study. In addition to the airborne spread of tuberculosis, fomites and the autopsy table were mentioned as other methods of dissemination. Dr. Riley agreed with these observations but stressed his belief that the airborne route was the predominant route.

Dr. Langmuir commented on the data relative to the control of measles and chicken pox with ultraviolet light. He doubted the validity of Wells' conclusion that the droplet nucleus was the sole route of spread. Dr. Langmuir discussed the impracticality of ultraviolet light for control of these infections and stressed its lack of effect on the nasal secretions, which he considers to be the major source of transmission of the viruses. He agreed that some measles viruses will be spread by droplet nuclei and might thus be blocked by an effective ultraviolet light barrier.

Dr. Dingle commented on the intrafamilial spread of diseases and also stated emphatically that he felt the prevention of measles by use of ultraviolet light, even if possible, was not desirable because it would delay the age at which infection would occur, thus increasing severity. Dr. Riley stated that he was only evaluating the ultraviolet light work and was not recommending that measles be prevented.

Dr. Wright, in discussing the relationship between a more closed internal environment and the upsurge in some communicable diseases, emphasized the physical changes in the mucociliary action.

Discussant: Fred R. McCrumb, Jr.

Dr. McCrumb stated agreement with the basic principles discussed. He presented the following points in regard to plague, illustrating his remarks with slides:

A) Pneumonic plague is a disease of intimate contact.

B) Transmission occurs during the late phases of illness when many bacteria are expelled.

C) The disease is rapidly fatal. If antibiotic treatment is to be effective, it must be started within 18 to 24 hr after the clinical symptoms appear. Antibiotics of choice include streptomycin, chloramphenicol, or tetracycline. If therapy is initiated after 24 hr, organisms may be eradicated from the sputum, but death is still likely to occur. In monkeys, Dr. McCrumb has seen what appear to be streptomycin-resistant organisms.

D) The primary infection is of the lungs and it involves small particles.

Dr. Knight asked whether pneumonic plague patients have terminal circulatory collapse like other patients with overwhelming pneumonia. Dr. McCrumb answered that these patients show severe terminal respiratory distress, with some developing shock. In monkeys, parenteral infection results in the development of shock; with the respiratory route of infection, the terminal picture is pneumonia and suffocation.

Dr. Smith commented on Dr. Meyer's holistic concept with reference to the involvement of the entire respiratory tract. Dr. Langmuir took exception and stressed the need to consider specific parts of the respiratory tract as distinctly different portals of entry. For example, that area above the larynx is characteristically different from that area below the point of ciliated bronchi. The area in between is probably rarely invaded. He also felt that there was substantial epidemiological evidence that pneumonic plague is an airborne disease. Dr. Langmuir suggested that with watery sputum, small droplets are more

likely to be produced than with thick, viscid, mucous sputum.

In response to a question from Dr. Bennett, Dr. McCrumb stated that since the disease is usually without a bacteremic phase, blood cultures are frequently negative.

Dr. Tigertt commented on the diphasic febrile response and reported on a patient whose second febrile spike immediately preceded an antibody response.

Dr. Davenport inquired about the drug of choice for prophylaxis. Dr. Meyer stated that the prompt use of sulfonamides (3 to 4 g per day for 6 days) would abort the development of bubonic plague. However, an alternative effective course was the use of tetracycline (1 g per day for 6 days).

Dr. Dingle remarked on the lability of the plague organism. This characteristic, the occurrence of secondary cases, and the particle size were felt to merit further study.

Dr. Meyer discussed the liberation of toxins, especially two kinds from lysed organisms, and warned that overtreatment with streptomycin might result in the release of amounts of toxin that could be fatal. He suggested initial treatment with tetracycline with small added doses of streptomycin if necessary.

DISCUSSION OF: "AEROSOL INFECTION OF MAN
WITH *PASTEURELLA TULARENSIS*," FRED
R. MCCRUMB, JR.

Discussant: Samuel Saslaw

Dr. Saslaw emphasized the uniqueness of these studies in which small numbers of individuals were employed with notably worth-while results. He presented his own vaccination researches (4-6) in which volunteers were immunized with either the Foshay vaccine or a viable vaccine, together with the results of challenge. Serological data indicated that the viable vaccine produced longer-lived antibody responses (7). Clinical data also supported the viable vaccine as a more effective immunizing product.

DISCUSSION OF "PATHOGENESIS OF INHALATION
ANTHRAX," WILHELM S. ALBRINK

Discussant: Philip S. Brachman

Dr. Brachman discussed the rarity of reported cases of inhalation anthrax and the minimal con-

tact that each of the cases reported in the United States has had with *Bacillus anthracis*. He mentioned Carr's recovery of *B. anthracis* from the noses or throats of 14 out of 101 employees in a goat-hair processing mill sampled, the majority of these instances being from employees who worked in the dustier areas (1). The results of air sampling in the epidemic mill 4 months after the epidemic revealed an 8-hr calculated inhaled dose of from 140 to 690 *B. anthracis*-bearing particles less than 5 μ in diameter not associated with clinical cases (2). Serological work by Norman et al. (3) reveals antibodies in unvaccinated employees, with the greater percentage being employees in the dustier jobs. These findings suggest sub-clinical infection with the respiratory pathway as the route.

Dr. Cluff cited the many experiments done showing the importance of local conditions and systemic factors that may influence the characteristics of a disease following initiation of an infection. He described investigations showing that inoculation of anthrax bacilli into an area of chronic or established inflammation can materially increase the LD₅₀ of the bacteria and can lead to the production of a different type of disease than when the bacilli are inoculated into normal tissues. For example, injection of anthrax bacilli into normal skin of rabbits results in a systemic disease and death without development of a localized skin lesion. On the other hand, when the bacilli are injected into an area of established nonspecific inflammation in rabbit skin, a larger dose is required to kill the animal and a localized hemorrhagic lesion occasionally is produced. The possible implication of such an effect in the case described by Dr. Albrink of anthrax in a patient with coexistent sarcoidosis was re-emphasized.

Dr. Knight commented on the few cutaneous lesions he has seen in which the local reaction was extensive with only slight systemic reaction.

Dr. Wedum remarked on the local swelling exhibited by some people following immunization with the antigenic culture filtrate, especially after several booster inoculations. He also reported on the "eradication" of organisms in a fatal case of inhalation anthrax seen at Fort Detrick in 1951.

Dr. Nelson spoke about the special dynamics of particle concentration and movement at the junction area between the terminal bronchiole

and the alveolus; there is a sharp concentration gradient in this area with adequate lymphatic drainage for transportation of cells.

Mr. Hall commented on the similarity of air sampling results in a Philadelphia goat-hair mill to those of Fort Detrick.

Dr. Albrink summarized by calling attention to the work of Thorne, Molnar, and Strange (8) on the anthrax toxin and called for more work on the morphological expression of the terminal bronchial-alveolar area and site of action of the toxin.

DISCUSSION OF: "SOME EFFECTS OF VIRAL INFECTION ON AERIAL DISSEMINATION OF STAPHYLOCOCCI AND ON SUSCEPTIBILITY TO BACTERIAL COLONIZATION," HEINZ F. EICHENWALD, OLGA KOTSEVALOV, AND LOIS A. FASSO

Discussant: Vernon Knight

Dr. Knight praised the fine work presented and agreed on the interaction of bacteria and viruses in some patients. He stressed the differences with adult staphylococcal carriers and raised a question as to the relationship of the "cloud baby" to the adult carrier. He suggested the term "super-carrier" for the cloud baby and "stuffy-nose syndrome." Dr. Eichenwald stated he was unable to assess the importance of the cloud baby to the adult. He added that he had studied 12 to 14 separate cloud-baby epidemics.

Mr. Hall asked several questions related to the techniques of air sampling which revealed that in the sampling area there are up to 50-fold increases in staphylococci recovered. At the present, air is sampled from the exhaust ducts somewhat as in Dr. Riley's methods.

When Dr. Davenport asked about the adult parallel of the cloud baby, Dr. Eichenwald stated that he has no data at the present time.

In response to Dr. Francis' question about the viruses recovered, Dr. Eichenwald stated that five different viruses had been recovered, all from cloud babies.

Dr. Eichenwald clarified his use of infection and colonization as referring to the absence of disease but with recovery of the organism. The

nasal discharge was characterized as a thick, "muco-slightly-purulent" exudate containing only a few cells, most of which were polymorphonuclear leukocytes.

Dr. Middlebrook raised the idea of a nasal hair in the nares of cloud babies acting as a vibrating reed aerosolizer.

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